caused by the existence in the sun of irregular density-gradients, comparable in magnitude with the vertical gradient in the earth's atmosphere, will explain them efficiently.

THE CONSTITUTION OF THE SUN.—In No. 1, vol. xxix., of the *Astrophysical Journal*, Herr J. F. Hermann Schulz again brings forward the theory that the nucleus of the sun is in a liquid state. This theory, in its earlier forms, was propounded by Kirchhoff, modified by Zöllner, and, about twenty years ago, advocated by Herr Schulz, but the prevailing ideas concerning the sun's temperature then rendered it improbable.

However, in the light of the recent researches of Moissan and others, from which it may be deduced that the mean temperature of the sun is about 5400° C., Herr Schulz believes that a liquid nucleus best explains the observed phenomena, and on these lines he revives his theory. He further argues that various stellar phenomena may be explained on the assumption that many stars, too, are not entirely gaseous. The paper in which the discussion was included was read before the last meeting of the Astronomische Gesellschaft in Vienna, September, 1908, and also appears as an abstract from the *Vierteljahrsschrift der Astronomischen Gesellschaft*, part iv., 1908.

Still another solar theory is expounded in No. 4305 of the *Astronomische Nachrichten*. In this paper M. A. Amaftounsky, of Kichineff, explains the phenomena of sun-spots, metallic and gaseous prominences, sun-spot zones, &c., on the assumption that spots are caused by the outrush of heated vapour from the sun's lower atmosphere, and the filling in of the funnels thus formed by the photospheric clouds. The agreement of observed phenomena with the phenomena which would follow were the theory correct is discussed in detail.

RADIAL VELOCITY OF α PERSEI.—From thirty-seven spectrograms of α Persei, taken by Prof. Küstner and Dr. Zurhellen between August, 1904, and March, 1906, Herr F. Goos has derived values for the radial velocities of the star during that period. Previous observers have found that the variation of the velocity is small or non-existent.

In the present investigation Herr Goos made eight settings, each way of the plate, on twelve iron lines which are taken as standards, and found that the velocity, relative to the sun, varied between −3·65 km. and 0, the probable error for each plate being ±0·40 km. (*Astronomische Nachrichten*, No. 4300, p. 50).

A CATALOGUE OF 1625 SOUTHERN STARS.—Vol. ii. of the "Meridian Observations of the Perth Observatory (W. Australia)" contains the results of the meridian observations of 1625 stars between 39° and 41° south declination. As explained by Mr. Ernest Cooke, the director of the observatory, in the introduction, these results form part of the scheme undertaken by the Perth Observatory to determine, from time to time, the accurate positions of some 8000 stars lying in the zone 31°–41° S. declination. The positions now given are reduced to the equinox of 1900·0 at the epoch of observation, and, when known, the proper motions, for reduction to epoch, are also given.

THE MELBOURNE OBSERVATORY.—Mr. Baracchi's report of the work done at the Melbourne Observatory during the period 1906 December 1 to 1908 April 30 shows that the observatory is, apparently, now well established as a purely astronomical institution, the meteorological work having been transferred to the new Weather Bureau, under the Commonwealth Government, from the end of 1907.

The long-vacant post of chief assistant has now been filled by Mr. J. M. Baldwin, an 1851 Exhibition scholar, who has further qualified for the post by visiting and working at a number of English, Continental, and American observatories.

Mr. Baracchi reports, concerning the astrographic chart work, that, to April 30, 1908, 707 Sydney plates, containing 430,468 stars, and 991 Melbourne plates, containing 318,025 stars, were completely measured. The report concludes with a strong recommendation that, in accordance with the suggestion of the Solar Union, supported by the Royal Society, a solar physics observatory should be founded in Australia, preferably at Adelaide.

SCIENTIFIC AID FOR THE BRITISH TENANT FARMER.

THE various agricultural colleges founded or subsidised by the county councils take a wide view of their functions, and not only give instruction in agriculture to young men wishing to take up this subject, but also carry out field experiments designed to instruct those who are already farming, and who will not or cannot attend lectures. The field experiments are not strictly in the nature of research work, since they do not usually involve any new principles; they are not always arranged to give all the results they might, but, taken as a whole, they serve the very useful purpose of demonstrating to the farmer certain facts which he ought to know, but often does not, and of giving him opportunities of seeing for himself the effect of special manures on crops or of special feeding stuffs on animals.

The results of the field trials are published in pamphlet form by the college or department concerned, and widely distributed among the farming community. Recently the Board of Agriculture started a summary of these reports in its journal, and the idea is a very useful one. The South-Eastern Agricultural College publishes its reports in the form of an annual journal, while the University of Cambridge has periodically brought out full reports dealing with the whole of its experiments in the counties.

In the nature of the case, many of the reports issued are of local rather than of general interest, and do not call for any full treatment here, but a few instances may be quoted to show the type of work being done. Experiments at the University College of Wales, Aberystwyth, have been made to find out what ration will prove profitable for fattening bullocks. The fact that animals require a tolerably large maintenance ration (*i.e.* that they eat a fair amount of food without gaining in weight) renders it necessary that fattening should be rapid, but the difficulty then arises that a large ration gives proportionately less increase in weight than a small one. Up to a certain point an increase in the ration is profitable; beyond this point the profit gradually decreases, and loss arises. Prof. Jones has illustrated these facts very well in the report before us.

The Northumberland experiments deal with pasture problems. It has been demonstrated that basic slag is the most effective manure for economically improving the heavy soils of Northumberland, and a mixture of basic slag and a potash manure is best on the lighter soils. It has also been shown that second, and even third, dressings of slag are quite as effective as the first. The mangel experiments have shown that nitrate of soda gives better results than sulphate of ammonia, that slag is more effective than superphosphate, that sulphate of potash is better than the muriate, and that common salt much increases the crop. Experiments on other crops are also recorded.

Rather different results were obtained in the Scotch experiments on pastures summarised by Mr. Hendrick. Basic slag led to an improvement, but not much, and three or four years elapsed before sufficient return was obtained to pay for the slag. However, the improvement lasts, and can be seen six years afterwards, so that the method is profitable. No other manure was found to give profitable returns. This report gives analyses of the soils, and is therefore much more interesting than those in which soil analysis is ignored.

The West of Scotland Agricultural College has issued reports by Prof. McAlpine. The experiments on varieties of oats made during the years 1902–7 are summarised, and the effect of manures is discussed. Manuring has but little influence on the kernel weight, and only very slightly increases the proportion of kernel to husk.

The Lancashire County Council experiments were designed to test the relative value of limestone and of burnt lime for improving pastures, and the conclusion is drawn that limestone is the more effective, provided it contains 95 per cent. of calcium carbonate and is ground to a sufficiently fine state.

The farmer has not only to produce crops and beasts but to sell them, and success in one branch of his pro-

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fession does not necessarily imply success in the other. No amount of field experiments will make the farmer into a successful business man, but there is one way in which he can rely on getting the full value of his produce—by cooperation. Only in this way can the small farmer hope to buy and sell to the best advantage, and to make anything out of market fluctuations that are capable of yielding profit. This question is discussed in the *Quarterly Review* by "Home Counties," whose interesting article deserves to be widely read.

In conclusion, no notice of current agricultural publications intended for the tenant farmer would be complete without reference to the leaflets of the Board of Agriculture, which deal in simple manner with a large variety of important topics. Every effort is made to ensure that these leaflets should reach the men for whom they are intended.

THE BRITISH SCIENCE GUILD.

THE verbatim report of the third annual meeting of the British Science Guild, held at the Mansion House on January 22, has just been issued. We give extracts from the speeches made by Sir William Ramsay and Sir Frederick Pollock.

After referring to the work done by the Guild during the year, summarised in NATURE of January 28, Sir William Ramsay said:—"The greatest danger, I think, from which we suffer is this inherent one in the minds of so many of us, that it is not necessary to prepare beforehand for events which we can perfectly well prophesy will happen. I want to draw attention to one subject which I think a committee of the Guild ought to consider. It is not merely of the utmost importance to ourselves as a race, but it is of the greatest importance taken in connection with any legislative proposals of any Government. Let me give you an example from private life. No doubt most of us, perhaps all, have made our wills. We prepare, in a sense, for death. That is to save our successors from a considerable amount of trouble. Again, if we are well, we safeguard ourselves. We do not go into infected places, we indulge in exercise, we take a reasonable amount of sleep—in fact, we try to keep well; and if we fall ill from any chance we call in a doctor and take other measures to cure ourselves. In other words, we try our best to prolong our lives. Now, it appears to me that one of the duties of the State is to prolong the life of the nation. What does the life of the nation depend on? It depends not only upon the fitness of the people, but upon the amount of natural energy which is available to be used for driving power. We know pretty well from the results of the Royal Commission that our coal mines will not last for an indefinite time. Some say three hundred, others eight hundred years. Let us put it at five hundred. We can turn our minds back to the year 1400. We certainly did not know the people of England in those times, but many of us have a very lively knowledge of the sort of people they were and what they have done for us. They did great things in developing the country, building many churches, carrying out reforms according to their lights. We are now enjoying the benefits of what they did. Is it not only right and natural that we ought to have some consideration for persons living three or five hundred years hence? It does not need many "greats" before "grandson" until that time is reached in the picture of the mind—probably only six or seven. We ought in the present day to have consideration for the generations who will succeed us, and who will either profit by our foresight or regret our stupidity. Now, in this country our water-power is quite insignificant, and, indeed, if it were much larger than it is there is not much to be made of it. It has been calculated that the total water-power of Europe, excluding, perhaps, some few rivers in northern Russia, is equal to 2,000,000 horse-power. Why, we use 100,000,000 horse-power in England, so that even if we possessed the whole water-power of Europe we should hardly be supplying one-fiftieth of what we use from coal. I know there is a popular superstition that in view of the extraordinary inventions which we are witnessing in these days—long-distance telegraphy and so on—something will be discovered in the future which will replace our present source of energy. One cannot say with absolute certainty that that will not happen, but I think any scientific man will say it is in the highest degree improbable. And what else have we to come and go upon? You may say that we might have an apparatus to utilise the tides; but the first storm knocks to bits any apparatus. Or solar heat? Again the first storm plays havoc with any machinery—and that of the costliest. One possibility is to dig a big hole deep enough into the earth and hope to get boiling water. Well, curiously enough, to-day's *Morning Post*, in its "Discovery and Invention" column, describes how Mr. Parsons has considered that very question. He says that to bore a hole twelve miles deep would cost 5,000,000*l.* and take eighty years. If we are going to bore that hole, ladies and gentlemen, it is time we began. Joking apart, without that possibility, there is no other source of energy. Now this points to the economisation of coal. It points to legislation in other directions. Are we going to limit the use of steam engines? Gas engines give us about three times the power for the same consumption of fuel. Are we going to pay attention to the afforestation of the country, so that when coal is done we shall still have wood? Are we going to stop the enormous loss of nitrogen, which is so serious, that it will be impossible after fifty years to get the necessary amount for the growth of our plants? Are we going to utilise our sewage? All these are questions of first importance, and I think the Guild should appoint a committee to see how we can save the waste that is going on, and so give our country a chance of longer life. It would be horrible to look forward to London becoming a fishing village of five to ten thousand people, built on the top of some magnificent ruins and supported by scanty agriculture. But it is only what we should have to look forward to unless something is done. Let us postpone that evil day as far as possible."

Sir Frederick Pollock, in moving that the annual report be adopted, said:—"I have been asked to say a few words on the Patents Act, 1907, and to explain that the new matter in that Act, the only matter which attracts public attention, is not a revolutionary enactment or a breach with any established fiscal policy, but a revival of principles upon which the whole of our legislation for patents started, and on which it has been continued. In the earliest days of grants to inventors, the King exercised the power of granting monopolies at his own will and pleasure. In the course of the sixteenth century strong and well-founded objections were raised to the indiscriminate granting of monopolies, and it came to be accepted as a principle that monopolies ought to be granted to inventors only on condition of their being able thereby to introduce new industries into the kingdom. That was assigned as the consideration for which monopolies were granted. And further, during the early history of this branch of monopolies, which ultimately became the foundation of our modern Patent Law, it was understood that the inventor was bound, not only to work his invention within the kingdom, but to teach the use of it to all who desired to learn it. Those principles continued to be observed until comparatively modern times. But from some time in the latter part of the eighteenth century the principle of effectively introducing the new invention to this country was rather lost sight of, and it was supposed that the rule of publishing the invention, so that any competent person could learn from the specification to make it and work it for himself, would be sufficient for the protection of the public. In recent days it has been found that specification is not enough, for it was discovered that there was such a thing as the "obstructive" working of patents. That might be done in two ways. A man might acquire an invention, not for the purpose of introducing it to this kingdom, but, on the contrary, to stifle it and prevent it from being worked at all. That is a point which has, I think, been rather overlooked in some of the public discussions on this subject. I believe that that mischief existed, and that it was quite proper to put an end to it. The other obstructive way was for foreign manufacturers to take out or buy up a British patent, and so get a practical monopoly by being able to stop anyone from manufacturing the invention here. It is obvious that in both these ways "unfair prejudice" might

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